

Name: Solutions

1. Graph the parabola with quadratic equation $f(x) = 9 - x^2$

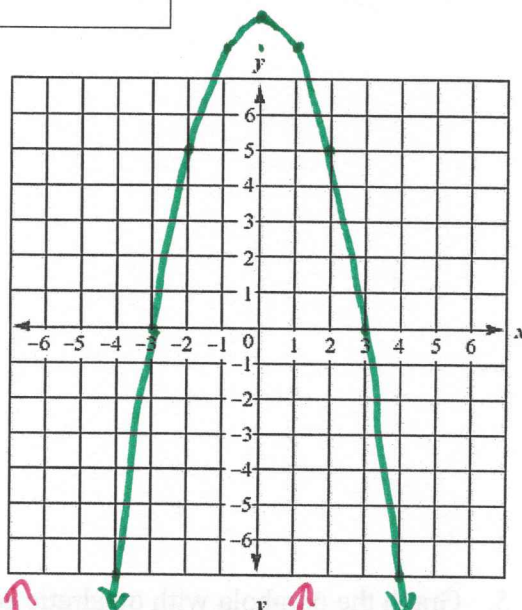
$$f(x) = -x^2 + 0x + 9$$

y-intercept $(0, +9)$

$$axis \quad x = \frac{-0}{2(-1)} = 0$$

$$f(0) = 9 - (0)^2 = 9 \quad \text{Vertex } V(0, 9)$$

$a = -1$ follow the pattern



2. Graph the parabola with quadratic equation $f(x) = x^2 + 6x$

$$0 = x(x + 6) \quad (0, 0) \text{ \& \& } (-6, 0)$$

$$\downarrow \quad \downarrow$$

$$x = 0 \quad x = -6$$

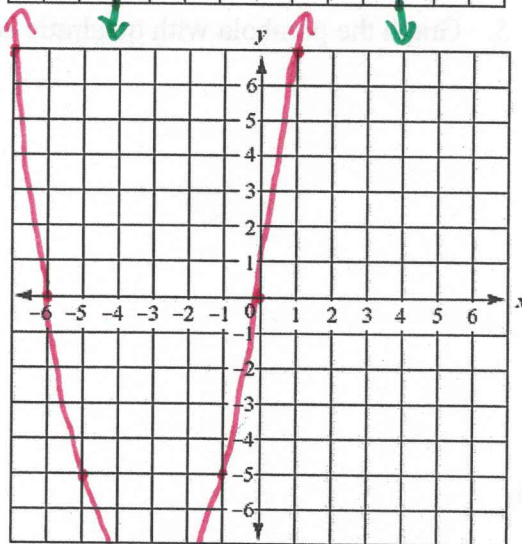
x-intercepts

axis at $x = -3$

$$f(-3) = (-3)^2 + 6(-3) = 9 - 18 = -9$$

Vertex $V(-3, -9)$

$a = 1$ Pattern 1, 3, 5, 7, ...



3. Graph the parabola with quadratic equation

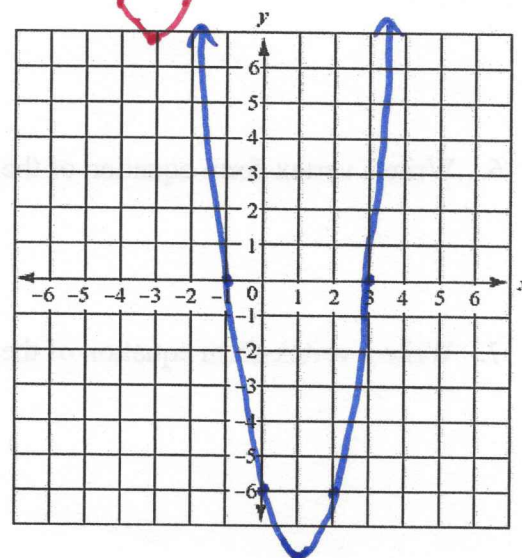
$$f(x) = 2(x+1)(x-3)$$

x-intercepts $(-1, 0)$ \& \& $(3, 0)$

$$axis \quad x = 1 \quad f(1) = 2(1+1)(1-3) = 2(2)(-2)$$

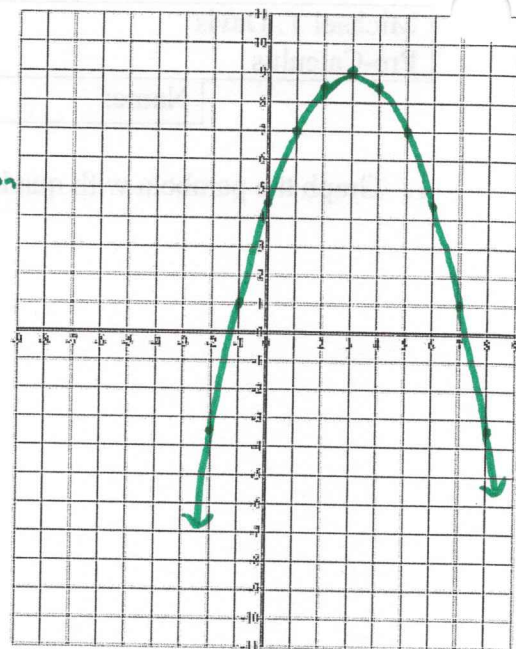
$$Vertex \quad V(1, -8) \quad = -8$$

$a = 2$ Pattern 2, 6, 10



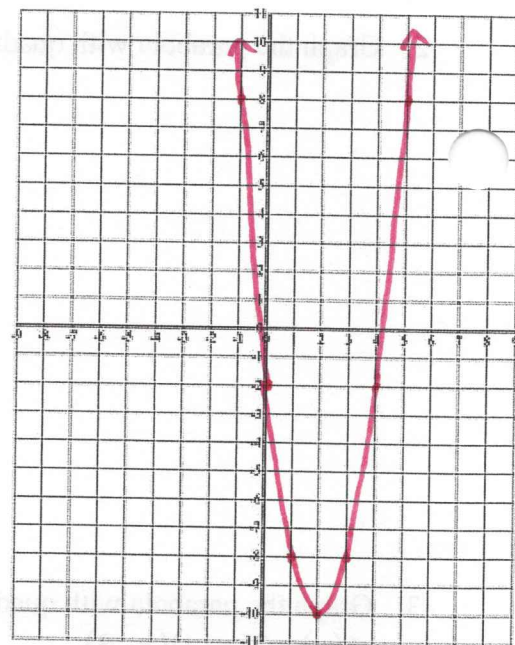
4. Graph the parabola with quadratic equation $f(x) = \frac{-1}{2}(x-3)^2 + 9$

Vertex $V(3, 9)$
 $a = -\frac{1}{2}$ Pattern $-\frac{1}{2}, -1\frac{1}{2}, -2\frac{1}{2}, -3\frac{1}{2}, \dots$



5. Graph the parabola with quadratic equation $f(x) = 2x^2 - 8x - 2$

axis $x = \frac{-b}{2a}$ $x = \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$
 $f(2) = 2(2)^2 - 8(2) - 2 = 8 - 16 - 2 = -10$
 $V(2, -10)$ $a = 2$ Pattern $2, 6, 10, \dots$



6. Write a vertex-form equation of the parabola that is concave down and has no x-intercepts

$$f(x) = -(x+4)^2 - 3$$

7. Write a vertex-form equation of the parabola that is concave up and has 1 x-intercept

$$f(x) = 2(x-7)^2$$

8. Write a vertex-form equation of the parabola with vertex $V(5, -3)$ and point $P(3, -1)$

$$f(x) = a(x-5)^2 - 3$$

$$-1 = a(3-5)^2 - 3$$

$$-1 = a(-2)^2 - 3$$

$$2 = a \cdot 4$$

$$\frac{1}{2} = a$$

$$f(x) = \frac{1}{2}(x-5)^2 - 3$$

9. Write a quadratic equation in factored form of the parabola containing the points $(4, 0)$, $(-1, 0)$ & $(1, -18)$

$$f(x) = a(x-4)(x+1)$$

$$-18 = a(1-4)(1+1)$$

$$-18 = a(-3)(2)$$

$$-18 = a(-6)$$

$$3 = a$$

$$f(x) = 3(x-4)(x+1)$$

10. Convert the quadratic equation $f(x) = x^2 - 8x + 10$ to vertex form

$$\text{axis } x = \frac{-(-8)}{2(1)} = \frac{8}{2} = 4 \quad f(4) = 4^2 - 8(4) + 10$$

$$= 16 - 32 + 10$$

$$= -6$$

$$\text{Vertex } V(4, -6)$$

$$f(x) = (x-4)^2 - 6$$

11. Convert the quadratic function $f(x) = \frac{1}{2}(x+4)^2 + 3$ to standard form

$$f(x) = \frac{1}{2}(x+4)(x+4) + 3$$

$$f(x) = \frac{1}{2}(x^2 + 8x + 16) + 3$$

$$f(x) = \frac{1}{2}x^2 + 4x + 8 + 3$$

$$f(x) = \frac{1}{2}x^2 + 4x + 11$$

12. Convert the quadratic function $f(x) = 2x^2 + 5x - 12$ to factored form

$$f(x) = (2x-3)(x+4)$$

13. Without graphing, determine the number of x-intercepts of the parabola with equation

$$f(x) = -3(x-1)^2 + 2$$

$a = -3$ opens downward $V(1, 2)$ 2 x-intercepts

14. Without graphing, determine the number of x-intercepts of the parabola with equation

$$f(x) = \frac{1}{4}(x+3)^2 - 1$$

$a = \frac{1}{4}$ opens upward $V(-3, -1)$ 2 x-intercepts

15. For the parabola shown, write the equation of the quadratic function in two out of the three forms.

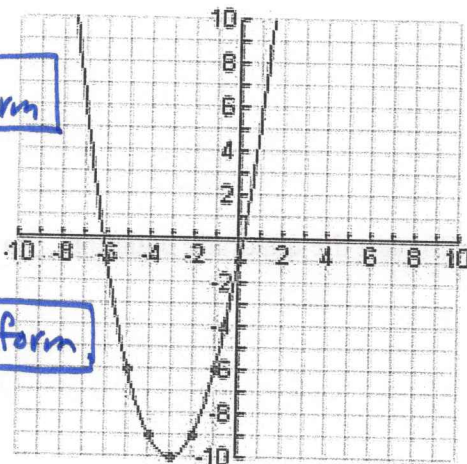
$a = 1$ $V(-3, -10)$

$f(x) = (x+3)^2 - 10$ vertex form

$f(x) = (x+3)(x+3) - 10$

$f(x) = x^2 + 6x + 9 - 10$

$f(x) = x^2 + 6x - 1$ standard form



16. For the parabola shown, write all three equation forms of the quadratic function.

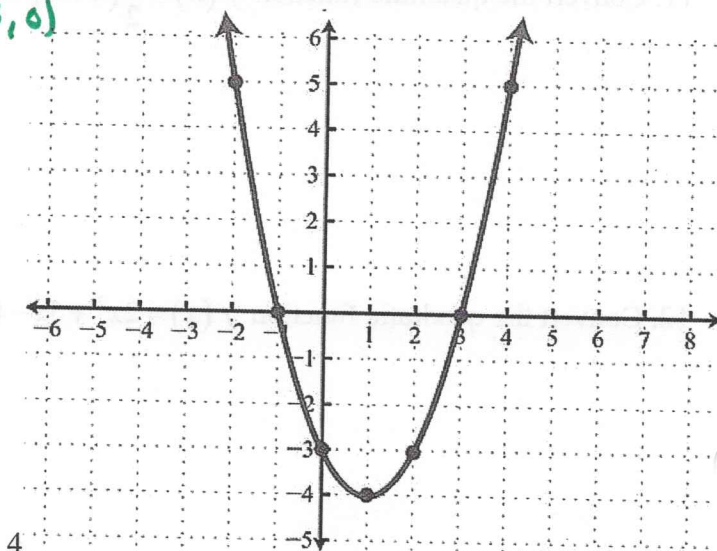
$a = 1$ x-intercepts $(-1, 0)$ & $(3, 0)$

$f(x) = (x+1)(x-3)$
x-intercept form

vertex $V(1, -4)$

$f(x) = (x-1)^2 - 4$
vertex form

$f(x) = x^2 - 2x - 3$
standard form



17. Determine the zeros of the quadratic function $f(x) = (3x-2)(x+4)$

Zeros
 $\{\frac{2}{3}, -4\}$

$$3x-2=0 \quad x+4=0$$

$$x=\frac{2}{3} \quad x=-4$$

18. Determine the zeros of the quadratic function $f(x) = 2(x+1)^2 - 8$ Correction to C
C should be -8

$$0 = 2(x+1)^2 - 8$$

$$8 = 2(x+1)^2$$

$$4 = (x+1)^2$$

$$\pm\sqrt{4} = \sqrt{(x+1)^2}$$

$$\pm 2 = x+1$$

$$-1 \pm 2 = x$$

$$x = -1-2 \text{ or } x = -1+2$$

$$x = -3 \text{ or } x = 1$$

Zeros
 $\{-3, 1\}$

19. Determine the zeros of the quadratic function $f(x) = x^2 - 5x$

$$0 = x^2 - 5x$$

$$0 = x(x-5)$$

$$\downarrow \quad \downarrow$$

$$x=0 \quad x=5$$

Zeros
 $\{0, 5\}$

20. Determine the zeros of the quadratic function $f(x) = x^2 - 5x - 24$

$$0 = x^2 - 5x - 24$$

$$0 = (x-8)(x+3)$$

$$\downarrow \quad \downarrow$$

$$x=8 \quad x=-3$$

Zeros
 $\{8, -3\}$

21. Determine the equation for the axis of symmetry of the parabola defined by the quadratic function

$$f(x) = (3x-2)(x+4)$$

Zero
 $x = \frac{2}{3}$

Zero
 $x = -4$

The axis is the midpoint of the zeros

$$\text{axis } x = \frac{\frac{2}{3} + -4}{2} = \frac{(-3\frac{1}{3})}{2} = \frac{(-\frac{10}{3})}{2} = -\frac{5}{3}$$

axis $x = -\frac{5}{3}$

22. Determine the coordinates of the vertex of the parabola defined by the quadratic function

$$f(x) = 2(x+1)^2 - 5$$

$V(-1, -5)$ vertex

23. Determine the coordinates of the vertex of the parabola defined by the quadratic function

$$f(x) = -3x^2 + 12x - 5$$

axis $x = \frac{-12}{2(-3)} = \frac{-12}{-6} = 2$

$f(2) = -3(2)^2 + 12(2) - 5 = -12 + 24 - 5 = 7$ Vertex
 $V(2, 7)$

24. Determine the coordinates of the vertex of the parabola defined by the quadratic function

$$f(x) = x^2 - 4x - 32$$

$x = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$

$f(2) = 2^2 - 4(2) - 32$

$f(2) = 4 - 8 - 32$

$f(2) = -36$

Vertex
 $V(2, -36)$